

Installation and operation manual

**Streaming Magnetic Tape Drive
Model PCT-1000
Mainstreamer**



IBEX COMPUTER CORPORATION

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9 TRACK MAGNETIC TAPE DRIVE

MODEL PCT-1000

INSTALLATION AND OPERATION MANUAL

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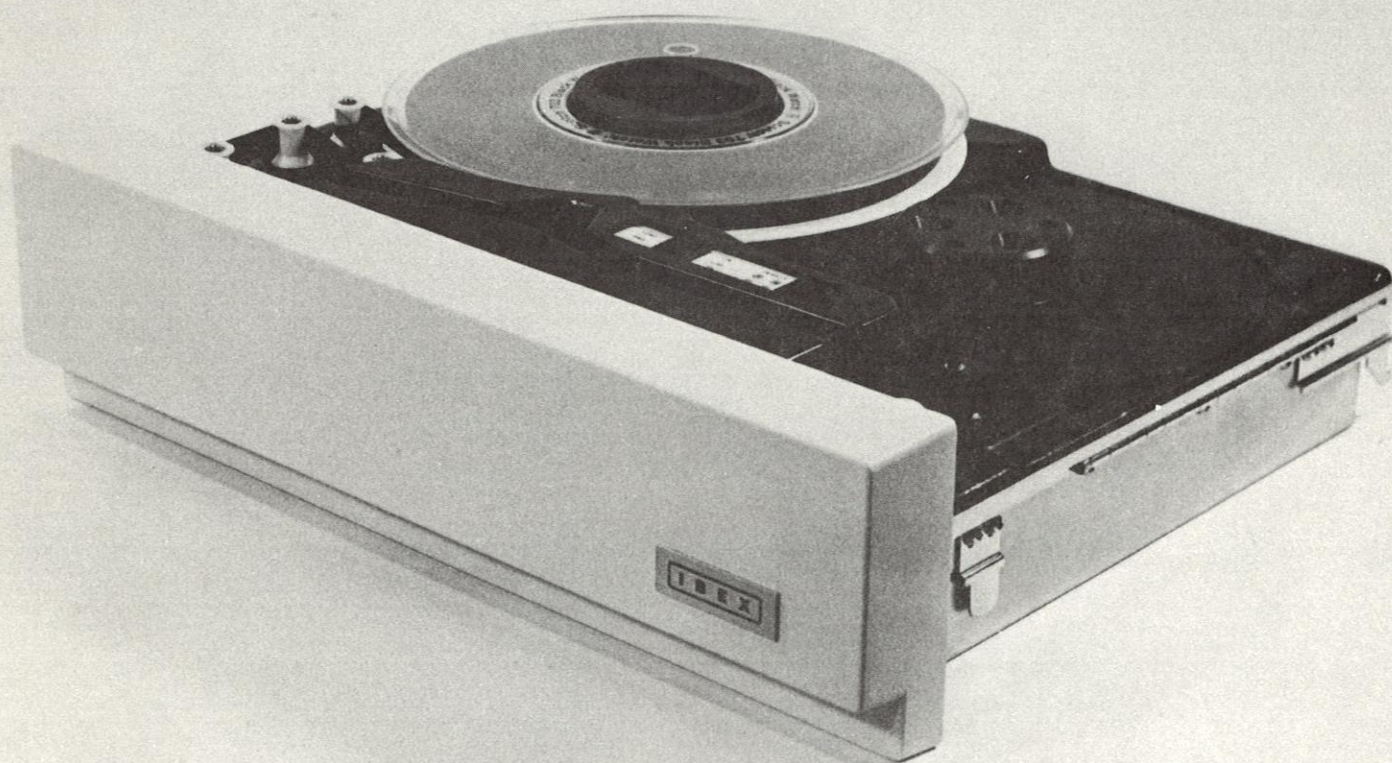
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IDEX MAINSTREAMER

N O T I C E

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions included in this manual, may cause interference to radio communications. Verification of compliance with Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference, is the responsibility of the installer.

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FOREWARD

This manual contains installation, operating, and integration instructions for the magnetic tape drive IBEX Model PCT-1000 MAINSTREAMER manufactured by IBEX Computer Corporation, 20741 Marilla Street, Chatsworth, California.

The IBEX Model PCT-1000 MAINSTREAMER offers both high speed and high capacity back-up for Winchester disk files, and standard IBM and ANSI inter-changeable format. The PCT-1000 MAINSTREAMER features the smallest physical size for a tape transport with its capability...fitting in a dual 8-inch Winchester or floppy disk drive footprint.

Front panel controls are simplified to be easily operated by non-technical personnel. Internal diagnostics test all functions, including Write and Read circuits during the tape loading sequence.

Included in this document are detailed equipment descriptions, specifications and installation instructions for the IBEX Model PCT-1000 MAINSTREAMER.

The first part of the report deals with the general situation of the country and the progress of the work during the year. It is followed by a detailed account of the work done in each of the various departments.

The second part of the report deals with the work done in each of the various departments. It is followed by a detailed account of the work done in each of the various departments.

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SERVICE AND WARRANTY

This IBEX product has been rigorously tested by trained personnel. The design has been engineered for simplicity which will assure a high level of reliability. Although all components have been selected from multiple manufacturer's stock, field repair of IBEX Model PCT-1000 MAINSTREAMER PCB Assemblies is not recommended because of the expense, complexity and firmware inter-relationships of the microcomputer and related RAM and PROM electronic elements. Unauthorized repair attempts will render the comprehensive IBEX warranty void. The unit has been designed for "plug-in" replacement of circuit boards and major components which will, together with the IBEX "Field Exchange Program," ensure minimum equipment down time.

IBEX Computer Corporation maintains stock of IBEX Model PCT-1000 MAINSTREAMER subassemblies at all times. In the event a failed subassembly is identified in the field, IBEX will ship a replacement PCB Assembly, freight collect, within 4 business hours after receipt of the customer's P.O. number verbally, by TWX or by confirming paper, said Purchase Order to be for the spare parts published price list amount for the replacement PCB Assembly. The defective PCB Assembly shall then be returned, freight prepaid, to IBEX for repair within one (1) week of shipment date of the replacement PCB Assembly. IBEX will repair, in accordance with the Warranty Policy of the following paragraphs, and return the repaired PCBA, freight prepaid, to the location specified by the customer. Upon the IBEX receipt of the returned replacement PCB Assembly in good condition, a 90% credit will be issued against the outstanding invoice for the replacement PCB Assembly.

IBEX warrants products of its manufacture to be free from defects in design, workmanship, and material under normal and proper use and service for a period of twelve (12) months after the date of shipment. IBEX agrees to repair or replace at the place of manufacture, without charge, all parts for said products which are returned for inspection to its factory within the applicable warranty period, provided such inspection disclosed that the defects are as above specified and provided also that the equipment has not been: (1) altered or repaired other than with authorization from IBEX and by its approved procedures, (2) subjected to misuse, improper maintenance, negligence, or accident damaged by excessive current or otherwise, or (3) had its serial number, or any part thereof, altered, defaced or removed. This warranty is in lieu of all other warranties, expressed or implied, including those of merchantability or fitness for purpose.

The first part of the report deals with the general situation of the country. It is a very interesting and informative study of the country's development. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is a valuable contribution to the study of the country's development.

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The third part of the report deals with the social situation of the country. It is a very interesting and informative study of the country's social development. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is a valuable contribution to the study of the country's social development.

Please read the instruction manual thoroughly regarding operation, maintenance, and components reference list. Should you require additional assistance in servicing this equipment, please contact IBEX Computer Corporation, Customer Service Department, 20741 Marilla Street, Post Office Box 4749, Chatsworth, California 91313-4749, TWX 910-493-2071. A trained service representative will be pleased to assist you.

1. The first part of the report is a general
introduction to the subject of the study.
2. The second part is a description of the
methodology used in the study.
3. The third part is a description of the
results of the study.
4. The fourth part is a discussion of the
results of the study.
5. The fifth part is a conclusion of the study.

SECTION I

INTRODUCTION AND PURPOSE OF EQUIPMENT

1.1 PURPOSE OF EQUIPMENT.

This manual provides a physical description, functional description, and specifications for the Formatted Tape Transport IBEX Model PCT-1000 MAINSTREAMER, manufactured by IBEX COMPUTER CORPORATION, 20741 Marilla Street, Chatsworth, California.

The transport can read and write data from magnetic tape that has been recorded in 9-track, NRZI and Phase Encoded, IBM-compatible format. Data can be read in either the streaming or start/stop modes at tape speeds of 25, 50 or 100 ips (0.635, 1.27 or 2.54 m/s) and at densities of 800, 1600 and 3200 characters per inch.

The transport is equipped with a dual-stack head that has the read and write gaps separated by 0.3 inch (7.6 mm). The dual-stack head configuration allows simultaneous write and read operations to be performed. Data recorded by the write head can be read by the read head after the tape has moved approximately 0.3 inch. This head configuration allows data to be read for verification immediately after being written.

The transport is operated directly from 100, 115, 200, 208, 220, 230 or 240v single phase power with a frequency between 48 and 400 Hz, 150 watts, nominal.

1.2 PHYSICAL DESCRIPTION

The PCT-1000 is designed for slide mounting in a standard 19-inch EIA rack and requires 5.25 inches of vertical space.

TABLE 1.1

MECHANICAL AND ELECTRICAL SPECIFICATIONS

Tape Tension	8 ounces +/- 1 ounce		
Tape Creepage	None		
Tape (computer grade)	Conforming to ANSI X3.40-1976		
Width	0.5 inch		
Thickness	1.5 mil (nominal)		
Rewind Time (2400 feet) of tape	2 1/2 minutes (nominal)		
Tape Speed (nominal)	<u>Low Speed</u> 0.635 m/s (25 ips)	<u>Med. Speed</u> 1.27 m/s (50 ips)	<u>High Speed</u> 2.54 m/s (100 ips)
Record Density	800 cpi 1600 cpi	3200 cpi	1600 cpi
Access Time (nominal)	40 msec	120 msec	260 msec
Command Reinject Time (nominal)			
Write	10 msec	5 msec	2 msec
Read	16 msec	4 msec	3 msec
Repositioning Time (nominal)	120 msec	360 msec	780 msec
Reel Sizes	7 inches 8.5 inches 10.5 inches		
Recording Characteristics	Records and reads data consistent with ANSI X3.39-1973 & ANSI X3.22-1973		
Power (nominal)	150 watts		
Input Voltages	100v, 115v, 200v, 208v, 220v, 230v, or or 240v +10% -15%		
Line Frequency	48 Hz - 400 Hz		
Temperature			
Operating	10° C to 40° C (50° F to 104° F (maximum operating ambient may not exceed maximum operating temperature specified by the tape media vendor.)		
Non-Operating	-40° C to 50° C (-40° F to 122° F)		
Shipping	-40° C to 70° C (-40° F to 158° F)		
Humidity			
Operating	20%-85% relative humidity without condensation (may not exceed operating humidity specified for tape.)		
Non-Operating	10%-90% without condensation		
Shipping	5%-95% without condensation		
Altitude			
Operating	0 to 2,438 m (0 to 8,000 ft)		
Non-Operating	0 to 3,000 m (0 to 10,000 ft)		
Shipping	0 to 15,240 m (0 to 50,000 ft)		

SECTION II

UNPACKING THE MAINSTREAMER

2.1 DESCRIPTION.

The transport is shipped in a protective container that meets the intent of National Safe Transit Specification (Project 1A). The container is designed to minimize the possibility of damage during shipment. The following procedure is to be used for unpacking the unit.

- (1) Place the shipping container on a low, flat surface.
- (2) Remove or cut tape from around top of carton and open flaps. Note that the unit is contained in a plastic bag and suspended in the carton on foam blocks.
- (3) Remove Installation and Operation Manual from carton, and mounting slide kit, if included.
- (4) Reaching to sides of unit, grasp metal chassis through plastic bag and lift drive from box. Place the unit on a convenient work surface.
- (5) Remove foam blocks from unit.
- (6) Cut open the poly bag containing the unit and remove the bag.
- (7) Check the contents of the shipping container against the packing slip and inspect the contents for any visible damage. Notify the carrier immediately if the contents are incomplete or any damage is noted.
- (8) Check the identification label for the correct model number and line voltage requirements.
- (9) Note the instructions written on the removeable label affixed to the MAINSTREAMER chassis I/O cable access hole and follow directions for the removal of shock absorbant material packed internal to the MAINSTREAMER and sandwiched between Printed Circuit Board assemblies (PCBA's).

2.2 POWER CONNECTIONS

A quick change power cord set is supplied for use with all Model PCT-1000 MAINSTREAMER transports. The 100/115v units are supplied with a standard domestic power cord. The 220/230/240v

units are supplied with an international 220v power cord. The female connector on the power cord mates with the male fuse holder/power connector on the rear of the transport. Connection to the power source is by the male connector of the power cord. The transport operating voltage is selected at the factory.

If necessary, change the primary tap connections as shown on the table below to suit the line voltage to be used:

Input Voltage	Line A	Line B	Jumper Connections
100	Red	Blk	Gry-Blk, Viol-Yel
115	Orn	Blk	Gry-Blk, Viol-Yel
200	Brn	Gry	Blu-Blk
208	Red	Gry	Blu-Blk
220	Brn	Gry	Viol-Blk
230	Red	Gry	Viol-Blk
240	Orn	Gry	Viol-Blk

2.3 VISUAL INSPECTION

Prior to applying power to the transport, perform the following visual inspection procedure.

- (1) Visually examine the transport for any evidence of physical damage that may have occurred during shipment.
- (2) Check the operating voltage connections to the power supply transformer primary tap locations. Ensure the voltage connections are correct for the line voltage of the application. Verify that a line fuse of the correct rating is installed.
- (3) Remove internal packing materials.

1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future.

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III. INSTALLATION

3.1 RACK MOUNTING THE TRANSPORT

The PCT-1000 MAINSTREAMER transport is designed to be mounted in a standard 19-inch EIA equipment rack. A vertical panel opening of 5.25 inches is required, and the depth behind the mounting surface must be a minimum of 18.7 inches.

ATTENTION

Check to verify rack stability with MAINSTREAMER extended for tape loading.

- (1) Select rack position desired and install slides.
- (2) Install front and rear bayonet brackets on drive chassis.
- (3) Install drive on slides, taking care to seat bayonets fully in slide pockets. Adjust slide spacing, if required.
- (4) Push drive into cabinet to check chassis and bezel clearance. Adjust bayonet positions.

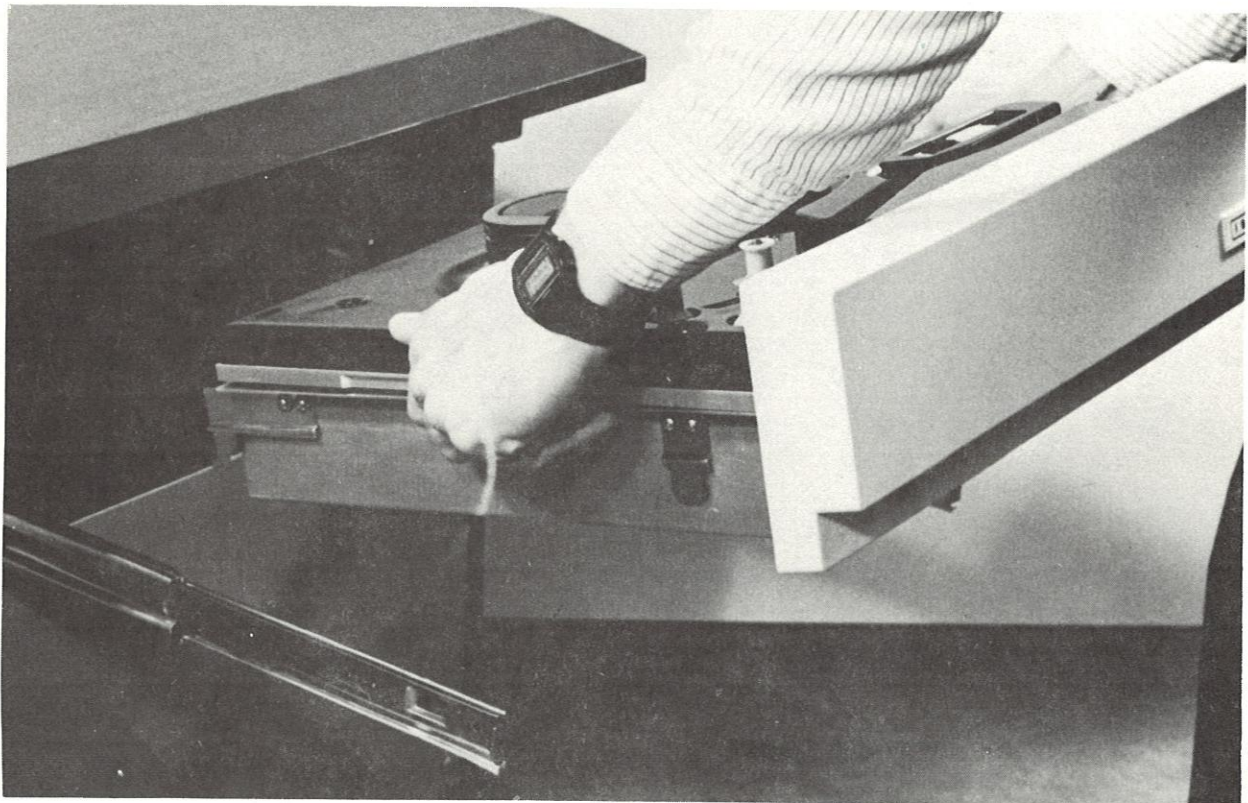


FIGURE 3-1. Slide Mounting

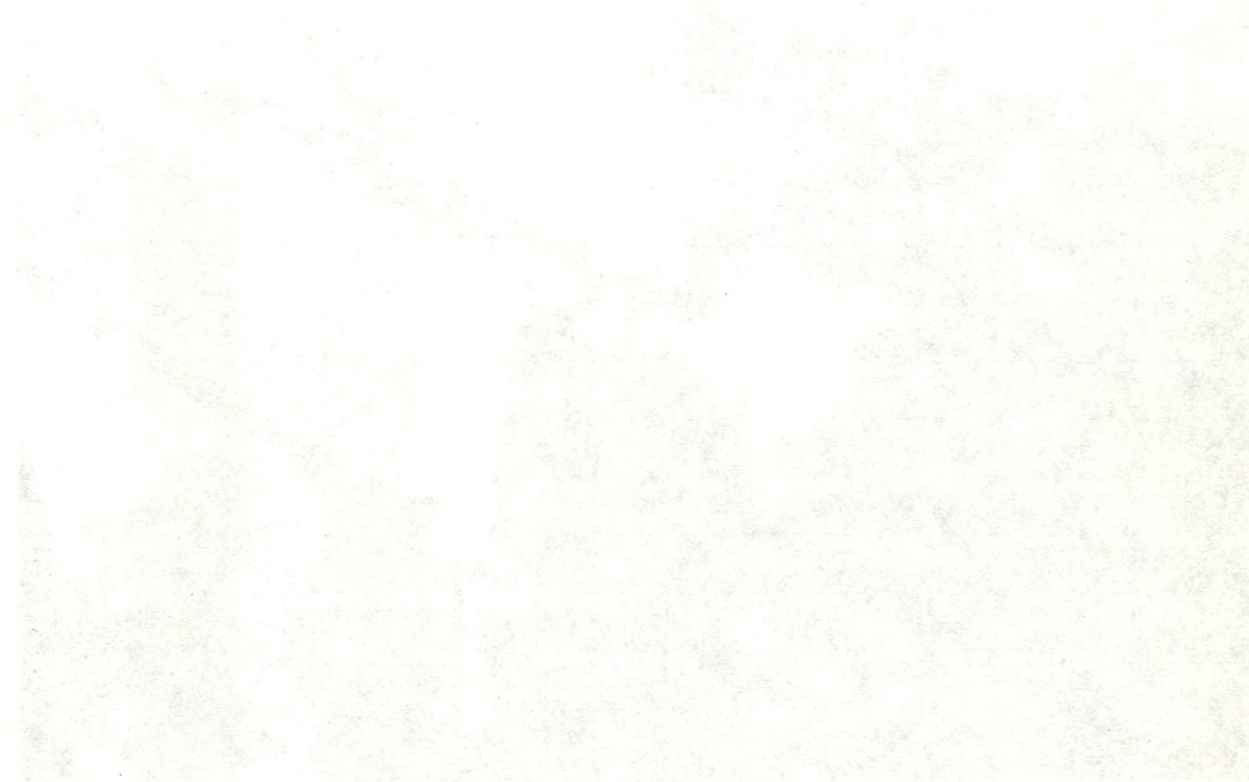
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and a list of references.

5. The fifth part of the report is a list of
appendices.



IV. INTERFACE SPECIFICATIONS AND INFORMATION

4.1 INTERFACE CABLES

The 50-lead flat cables, 28 AWG (3M Part No. 3365-50 or equivalent (not included)) provide the inter-connection between the Model PCT-1000 MAINSTREAMER and the host controller. Interface connectors are 3M3365-34 or equivalent. Maximum length for a cable connecting a controller to a single formatted transport is 20 feet. Interface connectors on the Control PCBA, are accessible through slots in the rear edge of the transport.

4.2 DAISY-CHAIN REQUIREMENTS

A maximum of eight Model PCT-1000 MAINSTREAMER transports can be connected in a daisy-chain configuration. The maximum total length for a cable connecting two or more transports to a controller in a daisy-chain configuration is 20 feet.

When connecting the Model PCT-1000 MAINSTREAMER transport in a daisy-chain configuration, ensure that only the last transport in the chain contains terminators for the P1 and P2 interface connectors. The terminators consist of 1C resistor packs installed in DIP sockets on the control PCBA. Also ensure that no two units in the daisy-chain are configured for the same transport address.

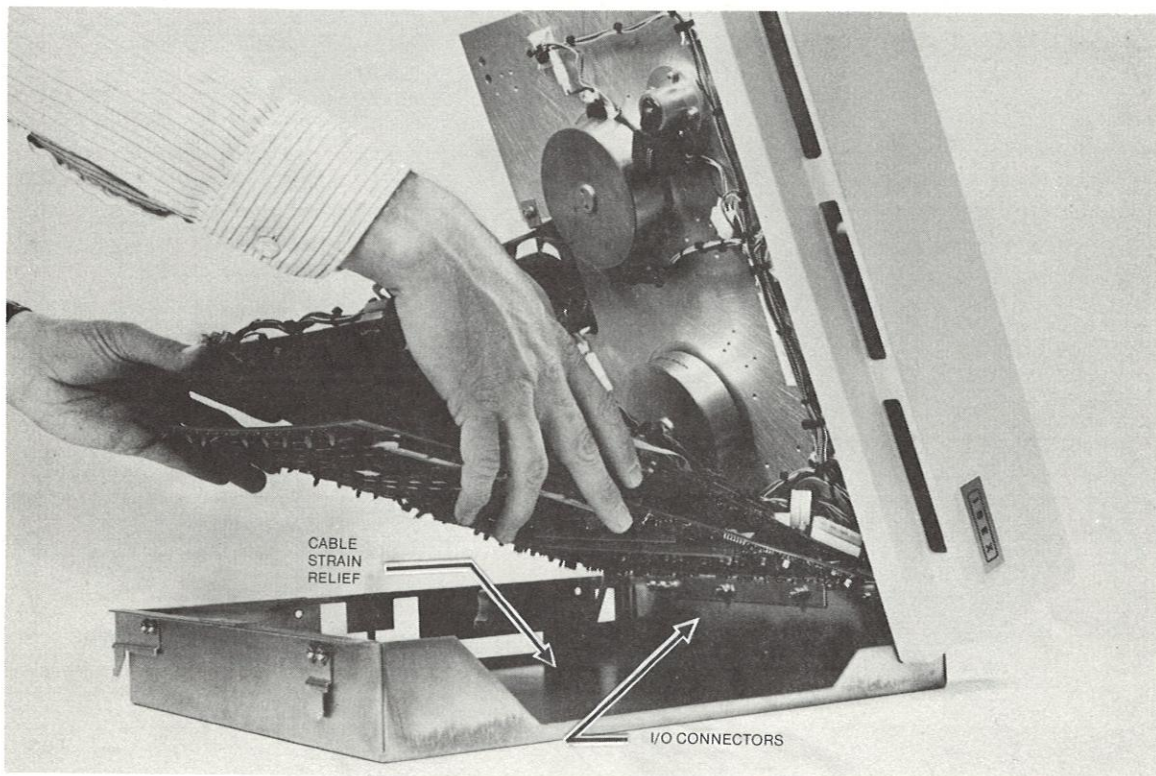


FIGURE 4-1. Formatter/Controller Interface Connection

V. INTERFACE DESCRIPTION

5.1 LOGIC LEVELS

Interface lines to and from the unit are TTL compatible, singled-ended terminator circuits consisting of a 220 ohm resistor to +5v and 330 ohm resistor to ground. All interface signal mnemonics are designated by the prefix "I".

Signal levels and pulse widths are as follows:

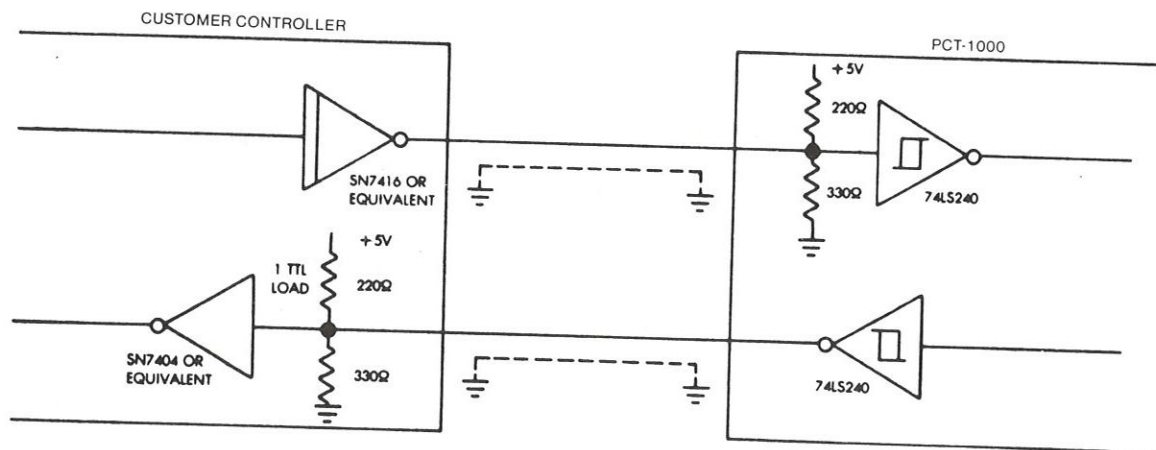
Levels: True = Low = 0 to +0.5v
False = High = +2.5 to +5v

Pulses: Pulse levels are as previously stated, pulse width 200 nanoseconds or greater.

The interface circuits are designed so that any disconnected interface line is interpreted as a logical false signal by the logic.

5.2 CONFIGURATION

Drive-to-controller drivers have a current sinking capability of 24mA maximum (74LS240 or equivalent). Receivers are 74LS240. See Figure 5-1.



NOTES:

1. NO MORE THAN 1 TTL LOAD SHOULD BE DRIVEN BY INTERFACE SIGNALS FROM THE CONTROLLER.
2. IMPROVED NOISE MARGIN WILL BE ACHIEVED IF THE RECEIVER IN THE CUSTOMER CONTROLLER SHOWN ABOVE IS REPLACED WITH

A SN74LS14 OR EQUIVALENT DEVICE HAVING SCHMITT TRIGGER INPUT CHARACTERISTICS. THIS IMPROVEMENT IN SIGNAL-TO-NOISE RATIO BECOMES MORE SIGNIFICANT AS CABLE LENGTHS INCREASE TO THE MAXIMUM ALLOWABLE SIZE.

FIGURE 5-1. Interface Configuration

The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom. It is shown that the structure of the atom is determined by the laws of quantum mechanics, and that the laws of quantum mechanics are in agreement with the experimental facts.

The second part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the elements of the periodic system. It is shown that the theory of the structure of the atom is in agreement with the experimental facts.

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VI. CONTROLS AND INDICATORS

All controls and indicators are located on the control panel of the transport. The following paragraphs describe the control and indicator functions. The control and indicator locations are shown on FIGURE 6.1.

6.1 POWER INDICATOR

This indicator is illuminated when secondary dc power is present.

6.2 DENSITY SELECTED INDICATOR

Indicates which of the three recording densities have been selected.

6.3 ON-LINE INDICATOR

Indicates the tape has been loaded and is at BOT or in a mid-tape position. Also shows the drive has been selected by the host computer and is ready or is receiving instructions from the host computer.

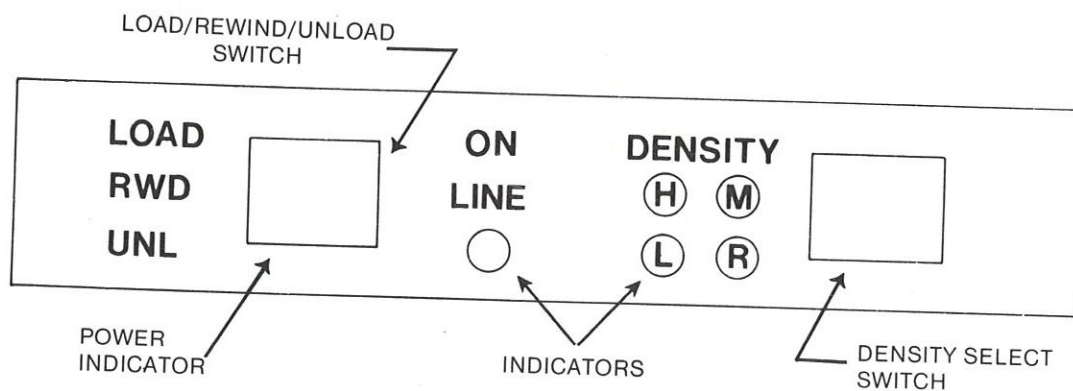


FIGURE 6-1 Controls and Indicators

6.4 LOAD/REWIND/UNLOAD CONTROL

This pushbutton switch is used initially to load a newly-threaded reel of tape, initiate tension and move the tape to Load Point. When the tape's metallic Beginning of Tape (BOT) foil is detected (by the photo cell detector located near the Read/Write head), the tape stops and positions itself with the BOT foil positioned over the BOT sensor. The "on-line" indicator indicates the tape drive is ready.

Depressing the load/rewind/unload pushbutton again with the tape positioned at BOT unloads the tape.

With the segment of tape positioned under the Read/Write head located in mid-tape, between the Beginning of Tape (BOT) and End of Tape (EOT), depressing the load/rewind/unload control takes the MAINSTREAMER "off-line" and rewinds the tape to BOT: depressing the load/rewind/unload switch two times successively takes the MAINSTREAMER off-line, rewinds to Load Point and proceeds to unload all tape onto the supply reel.

6.5 DENSITY SELECT

Power-On Default selects 1600 cpi PE, 25 ips operation.

Also, on power-up, the "remote" LED display is illuminated indicating the remote selection capability is enabled providing for host computer control. Operator (local) density select control overrides remote (host) density select control.

Depressing the density select control pushbutton advances the Read and Write density operation of the MAINSTREAMER to the next higher density.

Density selection may only be made before the tape is advanced beyond the Beginning of Tape (BOT) marker. The density select pushbutton control will have no effect while the Read/Write head is in mid-tape position.

5. The fifth part of the document discusses the role of the management in ensuring the integrity of the financial system. It describes the various responsibilities of management, such as establishing a strong tone at the top and implementing effective internal controls.

7. The seventh part of the document discusses the role of the regulatory bodies in overseeing the financial system. It describes the various types of regulations, such as accounting standards and securities laws, and explains how they can be used to protect the interests of investors and the public.

VII. LOADING AND UNLOADING TAPE ON THE TRANSPORT

7.1 LOADING TAPE ON THE TRANSPORT

Standing in front of the PCT-1000, you will see the supply reel is located to the left on the drive (see Figure 7-1). The tape must unwind from the supply reel when the reel is turned clockwise. To write on tape, a write enable ring is required on the supply reel.

To load a reel of tape:

- (1) Check to ensure the quick-release supply reel hub is in the unlocked position (red band is visible).
- (2) Position a reel of tape over the supply hub with write enable ring toward the transport.
- (3) Lock the quick-release hub by depressing the raised portion of the hub lever.

Thread the tape along the path shown in Figure 7-1. Wrap the tape leader onto the take-up reel so that the tape can be wound onto the reel in a clockwise direction.

Bring the tape to Load Point by:

- (1) switching power on to the PCT-1000; and
- (2) depress and release the load/rewind/unload button.

The tape will advance to Load Point and the PCT-1000 MAINSTREAMER will go on-line.

7.2 UNLOADING TAPE ON THE TRANSPORT

- (1) Depress and release the load/rewind/unload button. The tape will rewind to Load Point.
- (2) Depress and release load/rewind/unload button a second time. This action will take the PCT-1000 MAINSTREAMER off-line and wind all tape back onto the supply reel. When tape is mid-tape, the load/rewind/unload button may be depressed two times in succession to completely rewind and unload tape onto the supply reel.
- (3) Unlock the quick-release hub by depressing the raised portion of the hub lever.
- (4) Remove the reel of tape.

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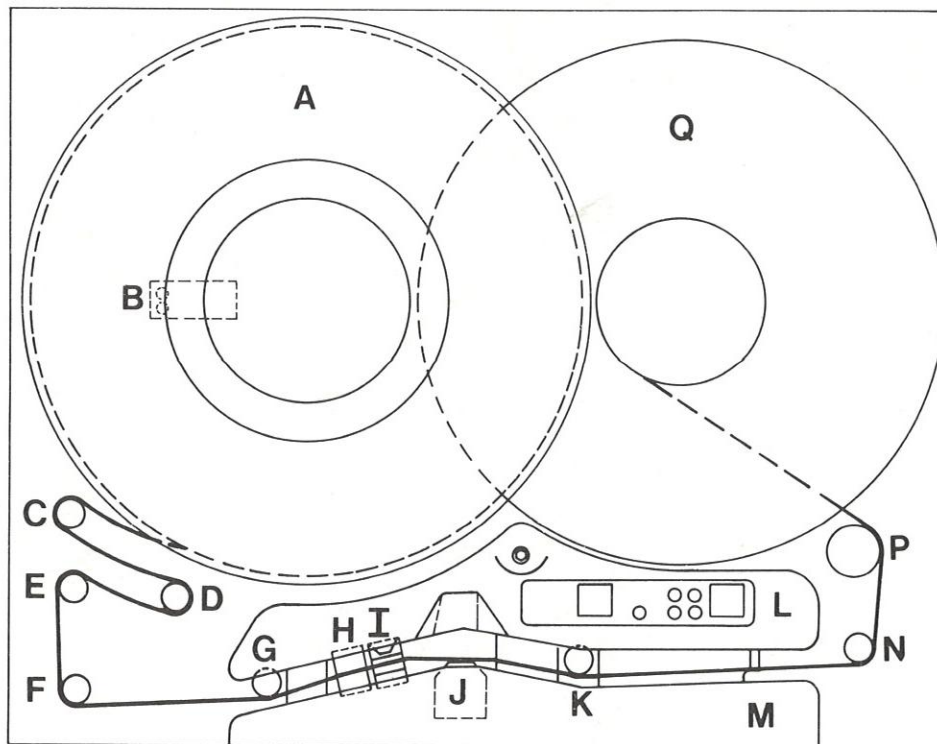
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|---|------------------------|---|-------------------------|
| A | Supply Reel | I | EOT/BOT Housing |
| B | Write Enable Sensor | J | Magnetic Head |
| C | Supply Roller | K | Right Tape Guide |
| D | Tension Arm Roller | L | Control Panel |
| E | Transition Roller | M | Right Head Plate Roller |
| F | Left Head Plate Roller | N | Tachometer Roller |
| G | Left Tape Guide | O | Take-up Reel |
| H | Tape Cleaner | P | Head Cover |

FIGURE 7-1. PCT-1000 MAINSTREAMER TAPE PATH

VIII. INTERFACE SIGNALS

8.1 CONTROLLER-TO-DRIVE INTERFACE LINES

8.1.1 FORMATTER ADDRESS (IFAD) AND TRANSPORT ADDRESS (ITADO, ITAD1)

These three lines in combination allow the controller to select one of several transports connected to the controller. The maximum number of transports that may be connected in a daisy-chain configuration is eight MAINSTREAMER units.

Drive Address Selection

Address	IFAD	ITADO	ITAD1
0	H	H	H
1	H	H	L
2	H	L	H
3	H	L	L
4	L	H	H
5	L	H	L
6	L	L	H
7	L	L	L

8.1.2 INITIATE COMMAND (IG0)

This 1 microsecond minimum pulse initiates the commands listed in Table 8-3. The trailing edge of IG0 strobes the signals (8.1.3-8.1.9) into the ready and selected unit and initiates tape motion. At the same time, the Formatter Busy signal (IFBY) is set low. The address lines must be held constant from the leading edge of IG0 until IFBY goes high.

8.1.3 REVERSE/FORWARD (IREV)

This signal is a level which specifies forward or reverse tape motion:

Low = Reverse
High = Forward

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1947-1948	1947-1948	1947-1948	1947-1948	1947-1948
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8.1.4 WRITE/READ (IWRT)

This signal is a level which specifies the operating mode of the system.

Low = Write
High = Read

8.1.5 WRITE FILE MARK (IWFM)

This signal is a level which when low causes a Write File Mark to be written on the tape, if IWRT is also low during this time.

8.1.6 ERASE (IERASE)

This is a level which when low in conjunction with a low level on the IWRT line, causes the transport to execute an erase variable length command. The transport will be conditioned to execute a normal write command but no data will be recorded. A length of tape, as defined by ILWD, will be erased. Alternately, if IERASE, IWRT, and IWFM command lines are low, the transport is conditioned to execute a dummy write file mark command. A fixed length of tape of approximately 3.75 inches will be erased. When command lines IWRT, IWFM, IEDIT, and IERASE are low, the transport is conditioned to execute a security erase operation. A length of tape, from the point where the command was issued to 5 feet beyond EOT, will be erased.

8.1.7 EDIT (IEDIT)

This is an additional command line which when low in conjunction with IWRT low, causes the unit to operate in the edit mode.

8.1.8 DENSITY SELECT (IRTH2)

The IRT2 signal in conjunction with the state of the IDEN signal specifies the data density during a write or read command. Selection is accomplished at BOT.

Low = 3200 cpi PE and 800 cpi NRZI
High = 1600 cpi PE

8.1.9 SPEED SELECT (IDEN)

IDEN in conjunction with IRT2 is used to select data density while at BOT.

The following truth table defines the interrelationship of IRT2 (density select) and IDEN (speed select) for remote density selection:

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It is divided into two main sections: the first section deals with the general situation and the second section deals with the progress of the work.

2. The second part of the report deals with the results of the work during the year. It is divided into two main sections: the first section deals with the results of the work in the field and the second section deals with the results of the work in the laboratory.

3. The third part of the report deals with the conclusions of the work during the year. It is divided into two main sections: the first section deals with the conclusions of the work in the field and the second section deals with the conclusions of the work in the laboratory.

4. The fourth part of the report deals with the recommendations of the work during the year. It is divided into two main sections: the first section deals with the recommendations of the work in the field and the second section deals with the recommendations of the work in the laboratory.

5. The fifth part of the report deals with the summary of the work during the year. It is divided into two main sections: the first section deals with the summary of the work in the field and the second section deals with the summary of the work in the laboratory.

	Density Select IRTH2	Speed Select IDEN	Tape Speed	Operation Density (Char./Inch)
	Low	High	25	800
Power on Default	High	High	25	1600
	High	Low	100	1600
	Low	Low	50	3200

Low = True = 0V
 High = False = +5V

IDEN is also utilized to select tape speed when the unit is conditioned to operate at 1600 cpi. When asserted, the transport operates at 100 ips. This line must be set up a minimum of 1 microsecond ahead of the trailing edge of IGO. Since it is latched in the transport, there is no hold time requirement. Repositioning when switching speed is automatic but delays the first command by about 1.2 seconds. There is no restriction as to when speed may be changed from 25 to 100, or 100 to 25 ips. Thus, the user may initiate a high-speed file search followed by low-speed data transfers, if this system is not able to utilize the full, high-speed, streaming data modes. All repositioning during speed switching is automatic and transparent to the user.

8.1.10 REWIND (IREW)

This 1 microsecond (minimum) pulse initiates REWIND in the selected, ready (not at Load Point) transport. If the selected transport is at Load Point, the command is ignored. The REWIND command does not assert the IFBY status line. The IRWD status will go low within less than 1 microsecond, and the IRDY will go high. A new command to this drive should be delayed until the status IRDY is low and IRWD is high. Other daisy-chained transports may be addressed while the transport is rewinding. The physical operation of a rewind involves running at 25 ips for about 20 inches in the forward direction before the reverse motion occurs. The average rewind speed is approximately 200 ips. When the tape reaches BOT, the drive ramps down and returns to BOT, where it stops, setting the ILDP and IRDY and resetting the IRWD status.

8.1.11 REWIND/UNLOAD (IRWU)

The pulse (1 microsecond minimum) modifies the standard rewind command by resetting the ON LINE status flip/flop and initiating an unload sequence when the transport encounters BOT.

8.1.12 FORMATTER ENABLE (IFEN)

This signal, which must be asserted by the controller, may be pulsed high (2 microseconds, minimum) to reset a READ, SEARCH, or WRITE command runaway during IDBY. It is ignored when IDBY is false. Command termination occurs within 50 milliseconds with a normal sequence: IDBY drops, then IFBY drops. This command cannot be used to terminate REWIND, UNLOAD, ERASE FIXED, WRITE FILE MARK, or extended status commands, since these commands cannot "run away." By limiting the IFEN in this way, all runaways can be terminated in an orderly manner with no loss of tape information.

TABLE 8-1. Interface Signals, Controller to Transport

PLUG	HOT PIN	GRD PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P1	4	3	Last Word	ILWD
P1	6	5	Write Data 4	IW4
P1	8	7	Initiate Command	IGO
P1	10	9	Write Data 0	IW0
P1	12	11	Write Data 1	IW1
P1	14	13	(Not Used)	(ISGL)
P1	16	15	(Not Used)	(ILOL)
P1	18	17	Reverse	IREV
P1	20	19	Rewind	IREW
P1	22	21	Write Data Parity	IWP
P1	24	23	Write Data 7	IW7
P1	26	25	Write Data 3	IW3
P1	28	27	Write Data 6	IW6
P1	30	29	Write Data 2	IW2
P1	32	31	Write Data 5	IW5
P1	34	33	Write	IWRT
P1	36	35	Density Select	IRTH2
P1	38	37	Edit	IEDIT
P1	40	39	Erase	IERASE
P1	42	41	Write File Mark	IWFM
P1	46	45	Transport Address 0	ITADO
P2	18	17	Formatter Enable	IFEN
P2	24	23	Rewind/Unload	IRWU
P2	46	45	Transport Address 1	ITAD1
P2	48	47	Formatter Address	IFAD
P2	50	49	Speed Select	IDEN

Date		Time		Location		Remarks	
1941	10/1	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/2	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/3	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/4	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/5	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/6	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/7	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/8	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/9	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/10	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/11	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/12	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/13	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/14	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/15	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/16	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/17	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/18	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/19	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/20	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/21	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/22	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/23	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/24	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/25	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/26	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/27	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/28	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/29	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/30	10:00	10:30	10:00	10:30	10:00	10:30
1941	10/31	10:00	10:30	10:00	10:30	10:00	10:30

TABLE 8-2. Interface Signals, Transport to Controller

PLUG	HOT PIN	GRD PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P1	2	1	Formatter Busy	IFBY
P1	44	43	(Not Used)	(IRTH1)
P1	48	47	Read Data 2	IR2
P1	50	49	Read Data 3	IR3
P2	1	-	Read Data Parity	IRP
P2	2	-	Read Data 0	IR0
P2	3	-	Read Data 1	IR1
P2	4	-	Load Point	ILD P
P2	6	5	Read Data 4	IR4
P2	8	7	Read Data 7	IR7
P2	10	9	Read Data 6	IR6
P2	12	11	Hard Error	IHER
P2	14	13	File Mark	IFMK
P2	16	15	Identification	IDENT
P2	20	19	Read Data 5	IR5
P2	22	21	End of Tape	IEOT
P2	26	25	NRZ	INRZ
P2	28	27	Ready	IRDY
P2	30	29	Rewinding	IRWD
P2	32	31	File Protect	IFPT
P2	34	33	Read Strobe	IRSTR
P2	36	35	Write Strobe	IWSTR
P2	38	37	Data Busy	IDBY
P2	40	39	Tape Speed	ISPEED
P2	42	41	Corrected Error	ICER
P2	44	43	On-Line	IONL

TABLE 8-3. Command Decoding

COMMAND	REVERSE (IREV)	WRITE (IWRT)	WRITE FILEMARK (IWFM)	EDIT (IEDIT)	ERASE (IERASE)
Read Forward	0	0	0	0	0
Read Reverse	1	0	0	0	0
Read Reverse Edit	1	0	0	1	0
Write	0	1	0	0	0
Write Edit	0	1	0	1	0
Write File Mark	0	1	1	0	0
Erase Variable Length	0	1	0	0	1
Erase Fixed Length	0	1	1	0	1
Security Erase	0	1	1	1	1
Space Forward	0	0	0	0	1
Space Reverse	1	0	0	0	1
File Search Forward	0	0	1	0	0
File Search Forward (Ignore Data)	0	0	1	0	1
File Search Reverse	1	0	1	0	0
File Search Reverse (Ignore Data)	1	0	1	0	1
Write Sync	0	0	0	1	1
3200 bpi*	1	0	1	1	1
1600 bpi (PE)	0	0	1	1	1

* Product Option

Low = 1 = True = 0V
 High = 0 = False = +5V

Date		Description		Amount	
1890	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1891	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1892	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	

8.1.13 WRITE DATA LINES (IW0-IW7)

These eight lines transmit write data from the controller to the formatter. The eight data bits on the Write Data lines are written onto the corresponding tracks on tape, IW7 corresponds to the least significant bit of the character.

The first character of the data record should be available on these lines within 40 character periods after Data Busy goes true and should remain true until after the trailing edge of the first Write Strobe pulse issued by the formatter. The next character must be set up a minimum of 100 nanoseconds before the next trailing edge (low to high) of IWSTR. Subsequent characters will be processed in this way until Last Word is set low, indicating that the last character is being transferred. Table 8-4 identifies the Write Data lines with regard to interface identification, ANSI track number and binary weight.

TABLE 8-4. Data Binary Weight Identification

WRITE LINE	BINARY WEIGHT	IBEX INTERFACE CHANNEL	ANSI TRACK
IW7	0	7	2
IW6	1	6	8
IW5	2	5	1
IW4	3	4	9
IW3	4	3	3
IW2	5	2	5
IW1	6	1	6
IW0	7	0	7
IWP	P	P	4

8.1.14 WRITE DATA PARITY (IWP)

This line is used only when external parity generation is configured. External parity generation requires the controller to generate odd parity on the Write Data lines and apply this parity bit to IWP. Set-up timing requirements for this line are consistent with requirements for IW0-IW7.

8.1.15 LAST WORD (ILWD)

During the execution of Write command or an Erase (Variable Length) command, this pulse is used to indicate that the next character to be strobed into the unit is the last character of

the record. The line will be set low by the controller a minimum of 300 nanoseconds before the next trailing edge (low to high) of IWSTR.

8.2 DRIVE TO CONTROLLER

8.2.1 FORMATTER BUSY (IFBY)

This signal goes low within 1 microsecond following the trailing edge of IGO and goes high following command completion. It is not desirable to wait for IFBY to be reset before issuing additional commands. The use of the trailing edge of IDBY is recommended.

8.2.2 DATA BUSY (IDBY)

This signal goes low after any repositioning, staying low during the active execution of all commands initiated by the IGO. On the trailing edge of this signal, another command of any type, direction, or speed may be given. IDBY goes low as soon as the tape has reached operating speed. IDBY will go low at least 100 microseconds before any data transfer, end of file, or block detection.

8.2.3 IDENTIFICATION (IDENT)

This is a level which goes low to identify 1600 bpi phase-encoded (PE) tapes. When reading forward from the BOT, the formatter monitors the parity channel for the presence of the identification burst. If an identification burst is detected, this line is set low for a short period of time as the BOT passes over the read head. An identification mark is not generated during 3200 bpi operation. An ID burst is detected by the presence of more than 80 character periods where only the parity channel is recorded, with the other channels erased. The absence of an ID burst will not prevent the transport from reading an otherwise valid 1600 bpi tape.

8.2.4 HARD ERROR (IHER)

This signal is pulsed when the record being written/read contains an uncorrectable error. The line goes low when an error is detected before IDBY goes high. Error conditions asserting this line include the following:

- a. Multiple-track dropout: Two or more tracks have analog envelopes dropping below the operating threshold before passing through the postamble. This is the most common type of hard error and can be distinguished from the others since it always occurs more than 25 microseconds after a correctable error.

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- b. Uncorrectable parity error: All tracks have valid envelopes, but the parity is even and the postamble has not yet been detected. This error can be detected by the absence of ICER while IHER is set, together with parity error on the transmitted data. An ICER may occur later, since the postamble is unlikely to be detected. This error can be caused by writing of incorrect parity when the external write parity option is selected.
- c. Non-0 character in postamble: The only allowable character in the postamble is a 0 (with even parity). This is checked during the first 20 postamble character intervals.
- d. Excessive skew: This error detection is indirect. A character bit will be lost, causing an unavoidable postamble detection failure and a consequent parity error when the postamble is entered.
- e. Loss of data envelope after postamble detection: 20 character intervals after the postamble provide time for the postamble to end and envelope detectors to decay. At the end of this time, there must be at least eight quiescent data channels, or an error will be reported.

8.2.5 CORRECTED ERROR (ICER)

This signal is pulsed when a signal-track is detected and error correction is in process. This will occur before IDBY goes high. These pulses occur throughout the rest of the data block, and they must be latched to be sensed at the IDBY transition. To ensure reliable recording on tape, the system must rewrite records containing hard or corrected errors on a read-after-write verification.

8.2.6 FILE MARK (IFMK)

This line is pulsed on a write verification or read operation when an IBM/ANSI compatible file mark is detected. This occurs prior to a false-going IDBY. If a file mark is not detected during a file mark write operation, the bad file mark should be backspaced with a SPACE REVERSE command, and the file mark should be rewritten. In PE mode a file mark is sensed when any two of the three tracks (channels 2, 6, and 7) which must be present for at least 15 character periods, and all three of the erased channels (channel 1, 3, and 4) are absent.

8.3 TRANSPORT STATUS AND CONFIGURATION LINES

The listed lines are used to indicate the status and

configuration of the selected transport and are defined in the following paragraphs.

Status: IRDY, IONL, IRWD, IFPT, ILDP, IEOT
Configuration: ISPEED, INRZ

8.3.1 READY (IRDY)

This level indicates that tape is tensioned and is not rewinding, off-line, loading, or unloading. In the event of a hard fault shutdown, the drive goes off-line and not ready. This line should be used to pre-condition any tape drive command.

8.3.2 ON-LINE (IONL)

This level indicates that transport on-line flip-flop is set. The transport may be placed on-line during or after tape load whenever the drive was off-line. This will go high within 1 microsecond of the reception of an UNLOAD command. When IONL is high, IRDY will be high.

8.3.3 REWINDING (IRWD)

This level indicates that the transport is in rewind to beginning of tape sequence. The status goes low within 1 microsecond of the REWIND command and stays low until the tape returns to BOT. IRDY is high while drive is rewinding.

8.3.4 FILE PROTECT (IFPT)

This level indicates that the loaded reel has no write enable ring, hence the write electronics are disabled, and write commands are prohibited. This status goes low during the tape-load sequence before the transport goes ready. This status is valid at all times when tape is loaded.

8.3.5 LOAD POINT (LDP)

This level is low when the load-point reflective marker is logically at the sensor. Since normal operation of the transport requires long ramps and repositions, when a command is executed at BOT, the ILDP status will remain low during the repositions. This is especially noticeable at 100 ips, when ILDP will remain low for 0.5 seconds after a command. If a REVERSE command runs into BOT, a command reset occurs with ILDP being set. If an illegal reverse command occurs at BOT, ILDP will remain low, but IFBY and IDBY will sequence quickly (in less than 10 milliseconds) in order to retain compatibility with other commands. In order to erase, ILDP goes low only at the end of a REWIND and is not set even when crossed over physically by the transport if it is "repositioning" and is not logically at the BOT marker.

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8.3.6 END OF TAPE (IEOT)

This level indicates that the end-of-tape marker is past the read/write head. This signal will go high either on a rewind or by backing up over the EOT marker. This signal should be considered accurate only to a few inches.

8.3.7 TAPE SPEED (ISPEED)

This signal indicates operating tape speeds of the selected transport. When true, the signal indicates transport operation in the high speed mode 2.54 m/s (100 ips) if 63 c/mm (1600 cpi) is selected, 1.27 m/s (50 ips) if 126 c/mm (3200 cpi) is selected. When false, the signal indicates transport operation in the low speed mode 0.635 m/s (25 ips) if 63 c/mm (1600 cpi) is selected.

8.3.8 NRZI/PE (INRZ)

This signal is used to report the data format mode in which the unit has been conditioned. When this level is low, the unit is in NRZI mode. When high, it is in PE or PE double density mode.

8.3.9 WRITE STROBE (IWSTR)

This is a pulse indicating (trailing edge) that the character on the data lines has been written on tape and the next character is needed. The next-character and last-word flag must have a set-up time of at least 300 nanoseconds ahead of the trailing edge of the IWSTR. The frequency of the IWSTR pulse is proportional to tape speed multiplied by bit density. The width of IWSTR is 2.0 (+/-0.1) microseconds.

8.3.10 READ STROBE (IRSTR)

This is a pulse which indicates that a read character is present on the controller interface. Note that although average long term transfer rate is the same as for write data, due to skew and velocity change, the instantaneous rate can be almost twice that of the write data. The fall of IDBY should be used to indicate the end of the command, since not all read and write commands will produce read strobes.

8.3.11 READ DATA (IR0-IR7,P)

These eight lines transmit read data from the unit to the controller. The eight data bits on the Read Data lines are read from the corresponding track on the tape. The read data lines overlap the ISTR by at least 500 nanoseconds.

8.4 BASIC PCT-1000 COMMANDS

The basic unit commands which are listed in Table 8-3 are described in 8.4.1 through 8.4.13. As previously mentioned, these commands are initiated when the LGO pulse strobes the proper combination of signals into the formatter. The following paragraphs provide a brief description of each command and the resultant modes of operation.

8.4.1 READ FORWARD

The Read Forward command causes tape on the transport to be accelerated to the operating speed. The transport reads the first record encountered. The microprocessor in the transport generates the delays necessary for proper tape positioning under the transport's read head. The next record on tape can be read by supplying a new Read Forward command to the transport during the reinstruct time delay, thereby improving the access time to the next record. This is referred to as on-the-fly operation. If the next command is not issued within the reinstruct time delay period, the Model PCT-1000 MAINSTREAMER goes through the repositioning sequence.

The tape transport reads data records or file marks in either a forward or reverse direction, generating output data (eight lines plus parity) and data strobes to the controller. A read reverse into Load Point clears the unit in the same way as does an IFEN reset. A read forward operation will be terminated if it occurs more than 15 feet beyond EOT. This prevents transport operation which could cause the tape to run off the end of the supply hub. Recovery threshold is automatically lowered during a read operation in order to provide additional reliability. For purposes of End-of-Block detection, the presence of less than two channels for 15 to 20 consecutive character intervals generates Gap Detect and drops IDBY. During the read operation, error detection, data transfer, and file mark search occur. These IDBY lines may be strobed by the trailing edge of IDBY. They remain valid for at least 1 and no longer than 100 microseconds.

8.4.2 READ REVERSE (NORMAL AND EDIT)

The Read Reverse command is similar to the Read Forward command, except that tape motion is in reverse. Records may also be read in the reverse on-the-fly. During any reverse operation, the formatter always resets to the quiescent state when the BOT is detected.

A Read Reverse command may be modified to position the head further back in the gap after reading a record. The change in position of the head facilitates editing of a record and is done by the formatter in response to an Edit command.

The second part of the document describes the various methods used to collect and analyze data. It includes a detailed discussion of the different types of data that can be collected, such as financial data, operational data, and customer data. It also discusses the various techniques used to analyze this data, including statistical analysis, data mining, and machine learning. The document concludes by noting that the use of these methods can help organizations to make more informed decisions and to improve their overall performance.

8.4.3 WRITE (Forward Only)

When executing a Write command, the Model PCT-1000 MAINSTREAMER starts tape and generates the proper delay before transferring the data character, ensuring the generation of

compatible inter-record gaps. When writing from Load Point, the dual-speed tape drive always generates the required PE identification burst. When IDBY goes true, it indicates that the first IWSTR (write strobe) will occur no sooner than 40 character intervals later. The write operation continues until ILWD (Last Word) is received by the transport, which indicates the last character in the data block. The tape will continue to move forward until the record has been read by the read head, then tape will go through the reinstruct time delay. Consecutive records may be written on-the-fly by issuing commands during the reinstruct time. If the next command is not issued within the reinstruct time delay period, the Model PCT-1000 MAINSTREAMER will go through the repositioning sequence.

8.4.4 EDIT

This operation is identical to basic write operation (or its variations), except that erase and write head currents are sequenced on to overlap the record being rewritten. This operation should be preceded by a read reverse or read reverse edit command to position in front of the block being edited. A block should be edited no more than three times to ensure proper gap spacing.

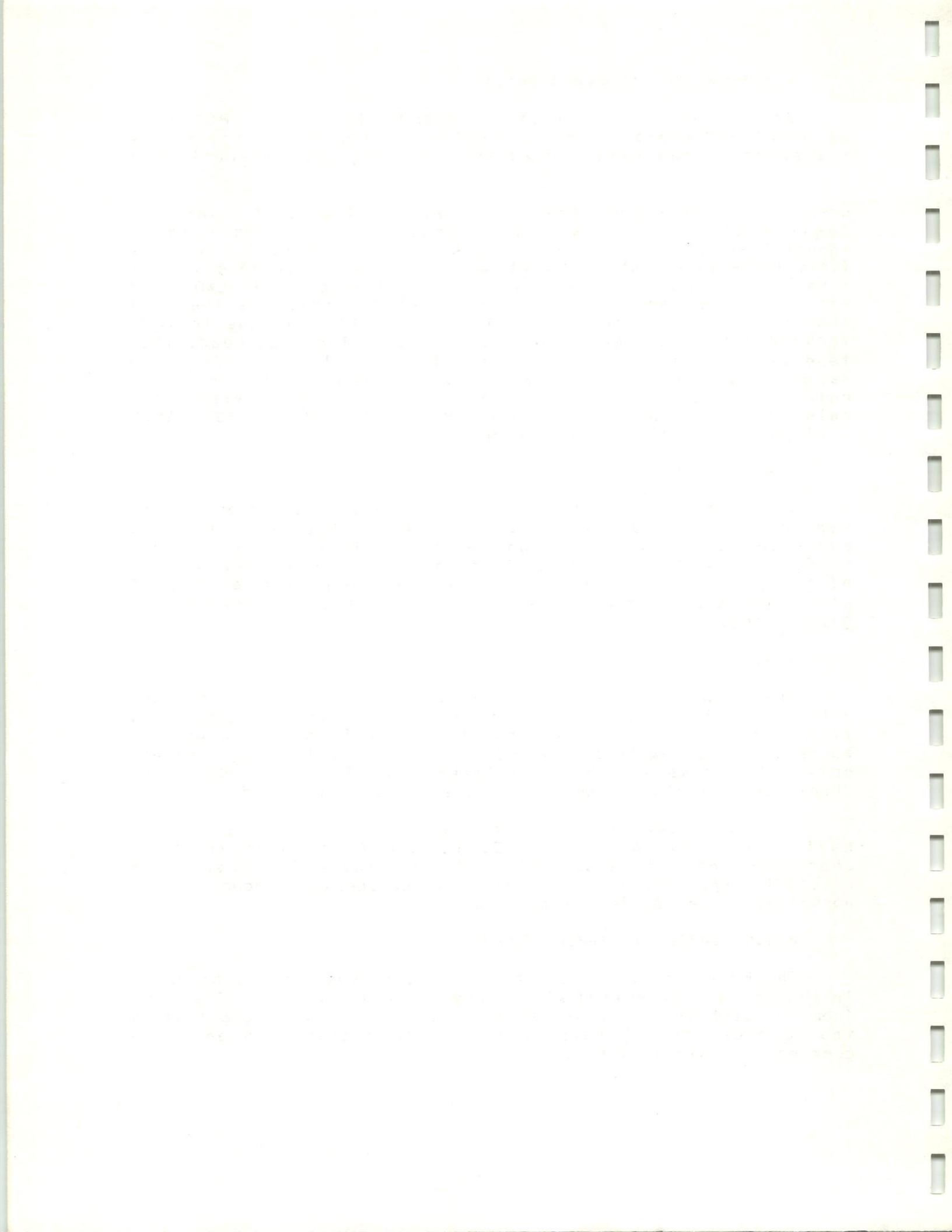
8.4.5 WRITE FILE MARK

This signal generates the compatible file mark and produces a (4.0-inch) IRG gap. The read file mark circuitry is activated. If a file mark status is not returned, the file mark should be backspaced and rewritten. In PE and PE (3200), all required and optional tracks are being written with 80 transitions (40 characters) of 0's. Channels 1, 3, and 4 are dc erased.

In NRZI mode, the file mark is a single character record having "1" bits in channels 3, 6, and 7 for both the data character and the LRCC. The CRCC contains all zeros. This record is separated by 3.5 inches from the previous record and a normal IRG from the following record.

8.4.6 ERASE (VARIABLE LENGTH)

The Erase (Variable Length) command causes tape to be moved in the forward direction with erase current on. An ILWD signal from the controller terminates the erase operation. Note that in the PE mode, the ID burst will not be erased when an Erase command is given from BOT.



8.4.7 ERASE (FIXED LENGTH)

The Erase command causes a 4 inch length of tape to be erased. This command is always executed while moving tape in the forward direction.

8.4.8 ERASE (SECURITY)

The Security Erase command causes the unit to erase forward to EOT and 5 feet beyond. Security Erase will execute at the speed selected by IDEN. IFBY and IDBY will assert as in a normal command sequence. Other transports can be selected while Security Erase is occurring. The transport may also be commanded to rewind after completion of Security Erase by issuing IREW after IDBY has asserted. The transport will indicate IRWD status immediately, but will complete Security Erase and rewind automatically. Other transports may be selected and used in this case also.

8.4.9 SPACE FORWARD

The Space Forward command is similar to a Read Forward command, except that no Read Strobe (IRSTR) signals or error flags are supplied to the controller. Although error checking is not performed, a test is made to determine if the record spaced over was a File Mark.

8.4.10 SPACE REVERSE

The Space Reverse command is similar to Read Reverse command, except that no (IRSTR) signals or error flags are supplied to the controller. Although error checking is not performed, a test is made to determine if the record spaced over was a File Mark.

8.4.11 FILE MARK SEARCH FORWARD (Ignore Data)

A File Mark Search Forward (Ignore Data) command causes the transport to execute a series of Read Forward commands while on-the-fly at the speed and density previously selected. This series is terminated when the File Mark character is detected, the EOT marker is located, or the unit is externally cleared. Tape is stopped when the File Mark is read as in a normal Read operation. If the EOT marker is detected during a File Mark Search, the operation is terminated if the tape is past the marker by 15 feet or more. The File Mark Search Forward command inhibits presentation of ISTR, ICER and IHER signals at the unit interface.

8.4.12 FILE MARK SEARCH REVERSE (Ignore Data)

A File Mark Search Reverse (Ignore Data) command causes the transport to execute a series of Read Reverse commands while on-

the-fly at the speed and density previously selected. This series is terminated when either a File Mark character is detected, the BOT marker is located, or the unit is externally cleared. Tape is stopped when the File Mark is read as in a normal Read operation. If the BOT tab is detected during a File Mark Search, the operation is terminated. The File Mark Search Reverse command inhibits presentation of IRSTR, ICER and IHER signals at the unit-to-controller interface.

8.4.13 FILE MARK SEARCH FORWARD WITH DATA

This command is the same as the File Mark Search Forward command described earlier, except the data circuitry is enabled and presentation of IRSTR, ICER and IHER is not inhibited.

8.4.14 FILE MARK SEARCH REVERSE WITH DATA

This command is the same as the File Mark Search Reverse command described earlier, except the data circuitry is enabled and presentation of IRSTR, ICER and IHER is not inhibited.

8.4.15 3200 BPI

This is a command which, when initiated while at the BOT marker, specifies the 3200 bpi mode of operation.

8.4.16 1600 BPI

This is a command which, when initiated while at the BOT marker, specifies the PE mode of operation.

1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future.

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IX. TIMING REQUIREMENTS

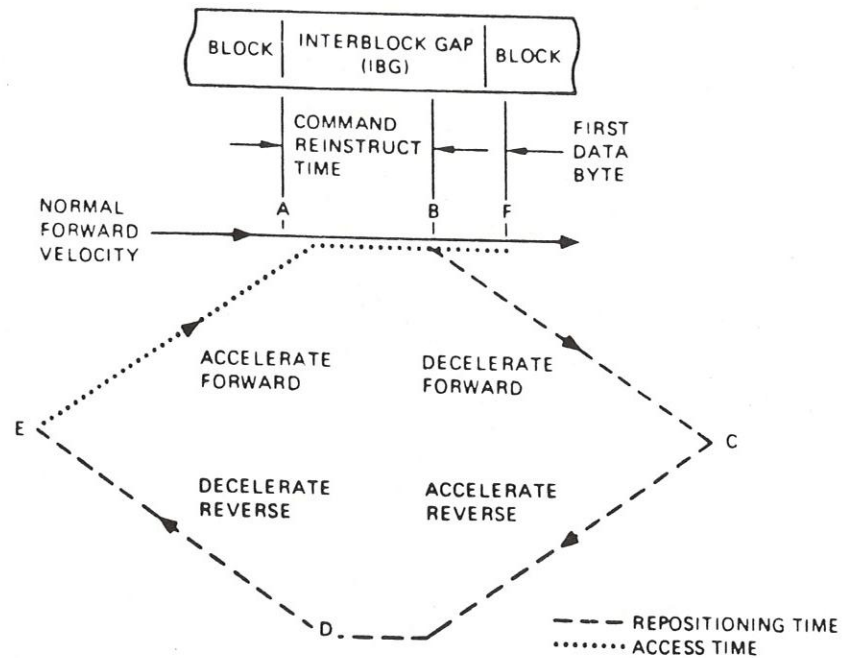


FIGURE 9-1. Reinstruct and Repositioning

9.1 ACCESS TIME

With the unit stopped, access time is measured from command reception (IG0) to the time when Data Busy (IDBY) goes low. Access time varies with transport speed, prior tape speed and direction, and duty cycle. Refer to Figure 9-1.

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DEPARTMENT OF CHEMISTRY

RESEARCH REPORT

1955-1956

BY

JOHN D. COOPER

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

9.2 COMMAND REINSTRUCT TIME

With tape moving forward at nominal speed, command reinstruct time is measured from completion of the last command (A on diagram) to the point where forward deceleration begins (B on diagram). It is defined as the time starting from IDBY of the last command going high to the time of the start of the repositioning cycle, when another command can be accepted in order for the unit to continue to stream. Command reinstruct time is a function of tape speed and the interblock gap length selected.

9.3 REPOSITIONING TIME

Repositioning time is measured from the end of the command reinstruct period through decelerate forward, accelerate reverse, and decelerate reverse. Repositioning time varies with tape speed and direction and the amount of tape left on each reel. If a new command is received after the reinstruct time and during the reposition time, the repositioning sequence is completed and the new command begins with the access time required to ramp up from E to A to B. If the next command is not received, the unit will come to rest and await the next instruction.

For purposes of repositioning, tape commands are separated into three categories:

Write commands:

- (1) Write a block of data.
- (2) Write a file mark.
- (3) Erase a fixed gap.
- (4) Erase a variable-length gap.

Read/Space forward commands:

- (1) Read a data block in the forward direction.
- (2) Space a data block in the forward direction.
- (3) Space a file mark in the forward direction.

Read/Space reverse commands:

- (1) Read a data block in the reverse direction.
- (2) Space a data block in the reverse direction.
- (3) Space a file mark in the reverse direction.

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When a command is followed by one in the same category and issued within the reinstruct time, repositioning will not take place. However, if a command is followed by one from another category, repositioning will take place even though the command is issued within the reinstruct time.

REPOSITIONING. Repositioning is accomplished in three steps:

- a. Deceleration of tape to a rest position (forward).
- b. Acceleration of tape to a maximum velocity in the opposite direction (reverse).
- c. Deceleration of tape to a rest position.

Figures 9-2 - 9-6 illustrate these three steps and show the relative positions of the record head with respect to the recorded data. The velocity during acceleration is equal to the record velocity of the tape (100, 25 ips). A write operation is used for the purpose of illustration; however, a read operation is identical, except that recorded data might be on either side of the record head.

Figures 9-2, 9-3, and 9-4 show the position of the head and the last data block following acceleration or deceleration. Figure 9-5 is a composite showing the position of the record head at any instant in time during repositioning. Segments AB, BC, and CD represent the actual repositioning, and segment DA is the acceleration after another command is issued (access time).

When operating at 25 ips, it requires slightly more time to decelerate in the forward direction than in the reverse direction and slightly more time to accelerate in the reverse direction than in the forward direction. This causes the graph to become distorted, as shown in Figure 9-6. Approximate times are shown in Table 9-1. The user should not be concerned with this since the microprocessor knows at all times exactly where the record head is in relation to the recorded data and will always generate the nominal 0.6-inch IRG.

Also, to allow for minor variations in acceleration and deceleration rates, the tape is allowed to run at speed for short distances during repositioning. This provides an offset, which is shown as points C and C' in Figures 9-5 and 9-6.

After repositioning, the record head might be left several data blocks in front of the point at which the next write or read operation is to take place. If one command is followed by another in the opposite direction, it becomes necessary to perform an additional repositioning to allow the required

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TO THE HONORABLE CHAIRMAN
OF THE BOARD OF TRUSTEES
OF THE UNIVERSITY OF CHICAGO

SIR: I have the honor to acknowledge
the receipt of your letter of the
10th inst. regarding the proposed
amendment to the University of Chicago
Charter.

I am pleased to learn that the
Board of Trustees has decided to
accept the proposed amendment.
I am sure that this decision will
be of great benefit to the University.

I am sure that the Board of Trustees
has acted wisely in accepting the
proposed amendment. I am sure that
this decision will be of great benefit
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to the University.

distance for tape acceleration, as illustrated in Figure 9-7. This illustration represents a reverse read following a forward write.

If one command is followed by another in the opposite direction, repositioning might leave the record head several data blocks on the wrong side of the point at which the next write or read operation is to take place. It then becomes necessary to reposition the head again in order to perform the operation. Figure 9-7 shows a reverse read following a forward write to illustrate this. It can be seen that the second reposition is a retrace of the first. It is shown offset in time for clarity only.

The double repositioning can be partially prevented if the new command is issued somewhere along segments AB or BC, in which case that segment will be completed and the command executed in the normal manner. If point C has been reached, however, the entire repositioning must be completed.

Repositioning may be required when a high-speed operation follows a low-speed operation, even though they are of the same category and in the same direction and the new command is issued within the reinstruct time. This is necessary to allow the tape ample time to accelerate to record speed. Figure 9-8 illustrates this and represents a high-speed file forward following a low-speed read. Repositioning will also occur at other miscellaneous times - for example, prior to rewinding.

Repositioning absorbs considerable time and can reduce data throughput drastically. Running at high speed with many repositionings can actually result in a lower throughput than running at low speed. For this reason, software routines should be structured to eliminate repositioning whenever possible.

On slower systems, or where large blocks of data must be processed between successive operations, it may give better results to perform all writing and reading operations at low speed and use the high speed mode only for file searching.

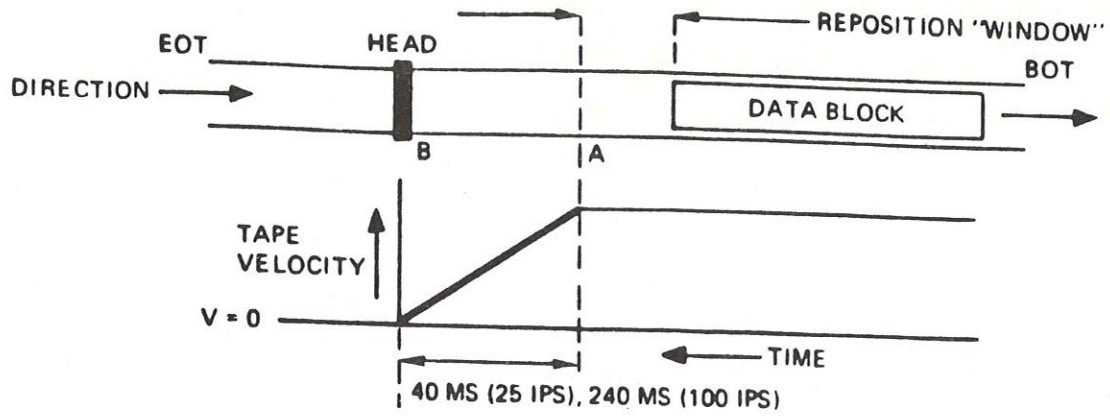


FIGURE 9-2. Ramp Down (FWD)

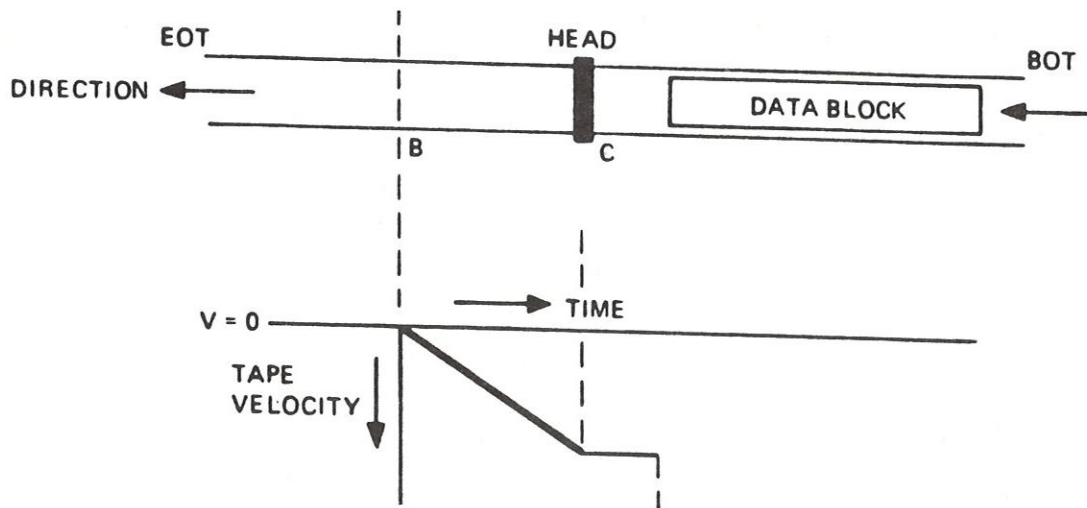


FIGURE 9-3. Ramp Up (REV)

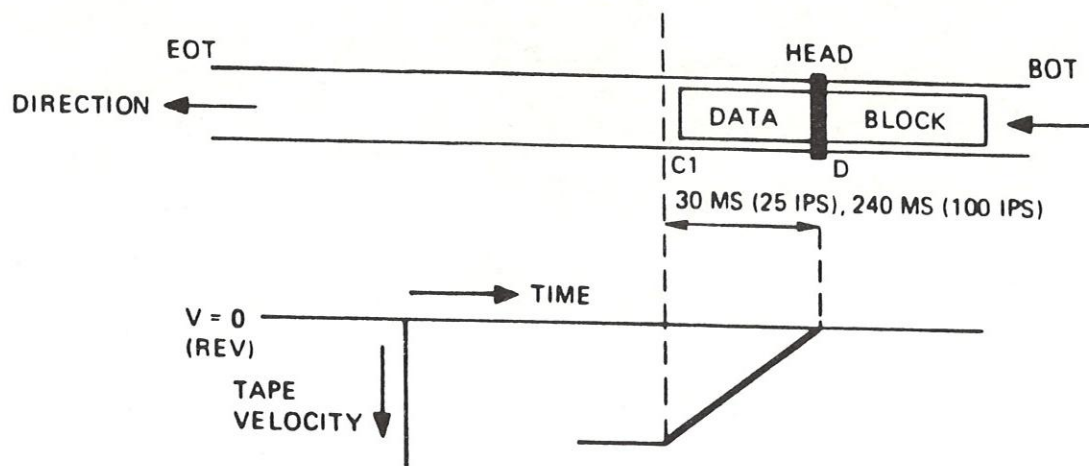


FIGURE 9-4. Ramp Down (REV)

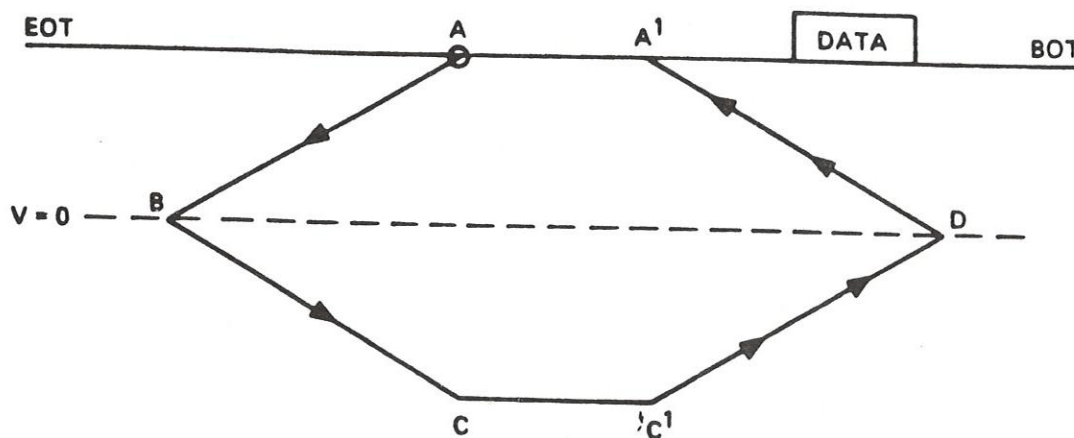


FIGURE 9-5. Composite Ramps @ 100 ips.



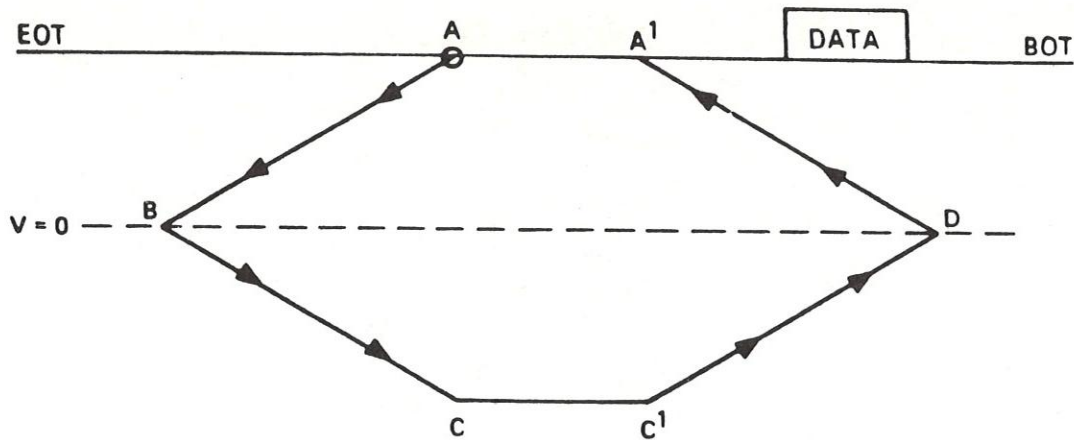


FIGURE 9-6. Composite Ramps @ 25 ips.

	25 ips	100 ips
Forward acceleration	30	240 ms
Reverse acceleration	40 mx	240 ms
Forward deceleration	40 ms	240 ms
Reverse deceleration	30 ms	240 ms

TABLE 9-1. Acceleration and Deceleration Times



THEOREM 1.1.1. Let A, B, C, D be points in the plane.

A, B, C, D are the vertices of a parallelogram	iff	$\vec{AB} = \vec{DC}$ and $\vec{AD} = \vec{BC}$
A, B, C, D are the vertices of a rectangle	iff	$\vec{AB} \perp \vec{AD}$ and $ \vec{AB} = \vec{DC} $, $ \vec{AD} = \vec{BC} $
A, B, C, D are the vertices of a rhombus	iff	$ \vec{AB} = \vec{BC} = \vec{CD} = \vec{DA} $
A, B, C, D are the vertices of a square	iff	$\vec{AB} \perp \vec{AD}$ and $ \vec{AB} = \vec{AD} $

PROOF. Let A, B, C, D be points in the plane. Suppose A, B, C, D are the vertices of a parallelogram. Then $\vec{AB} = \vec{DC}$ and $\vec{AD} = \vec{BC}$. Conversely, suppose $\vec{AB} = \vec{DC}$ and $\vec{AD} = \vec{BC}$. Then A, B, C, D are the vertices of a parallelogram. $\square$

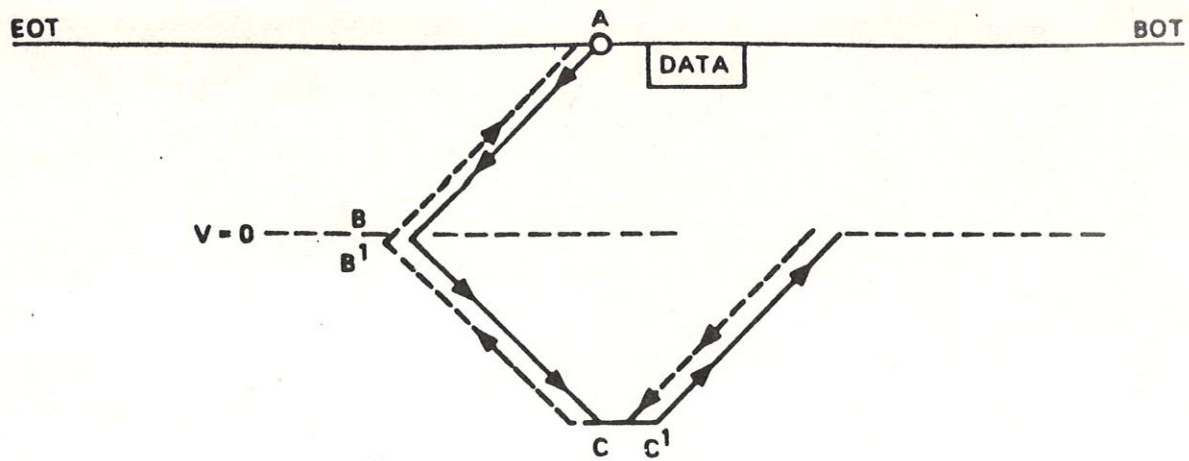


FIGURE 9-7. Reverse Direction Repositioning

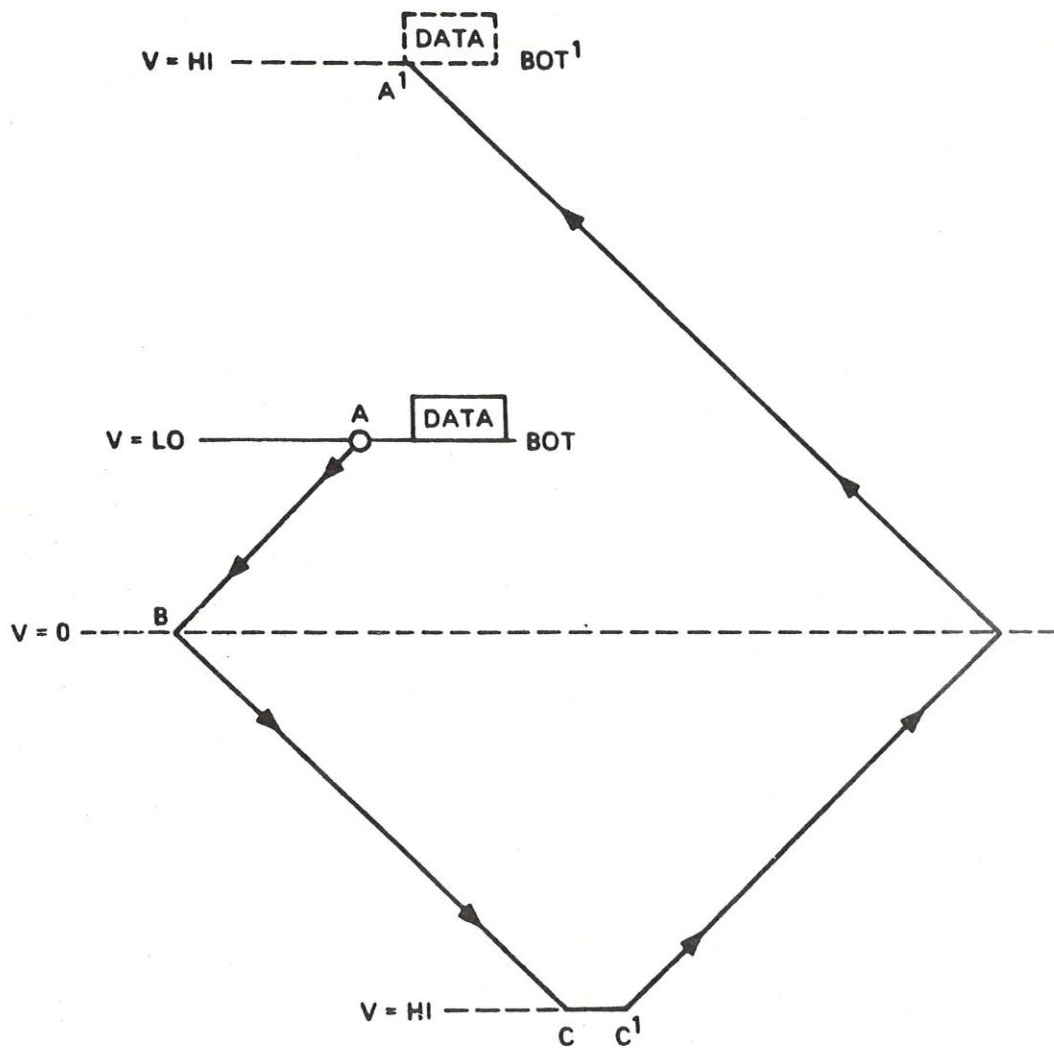
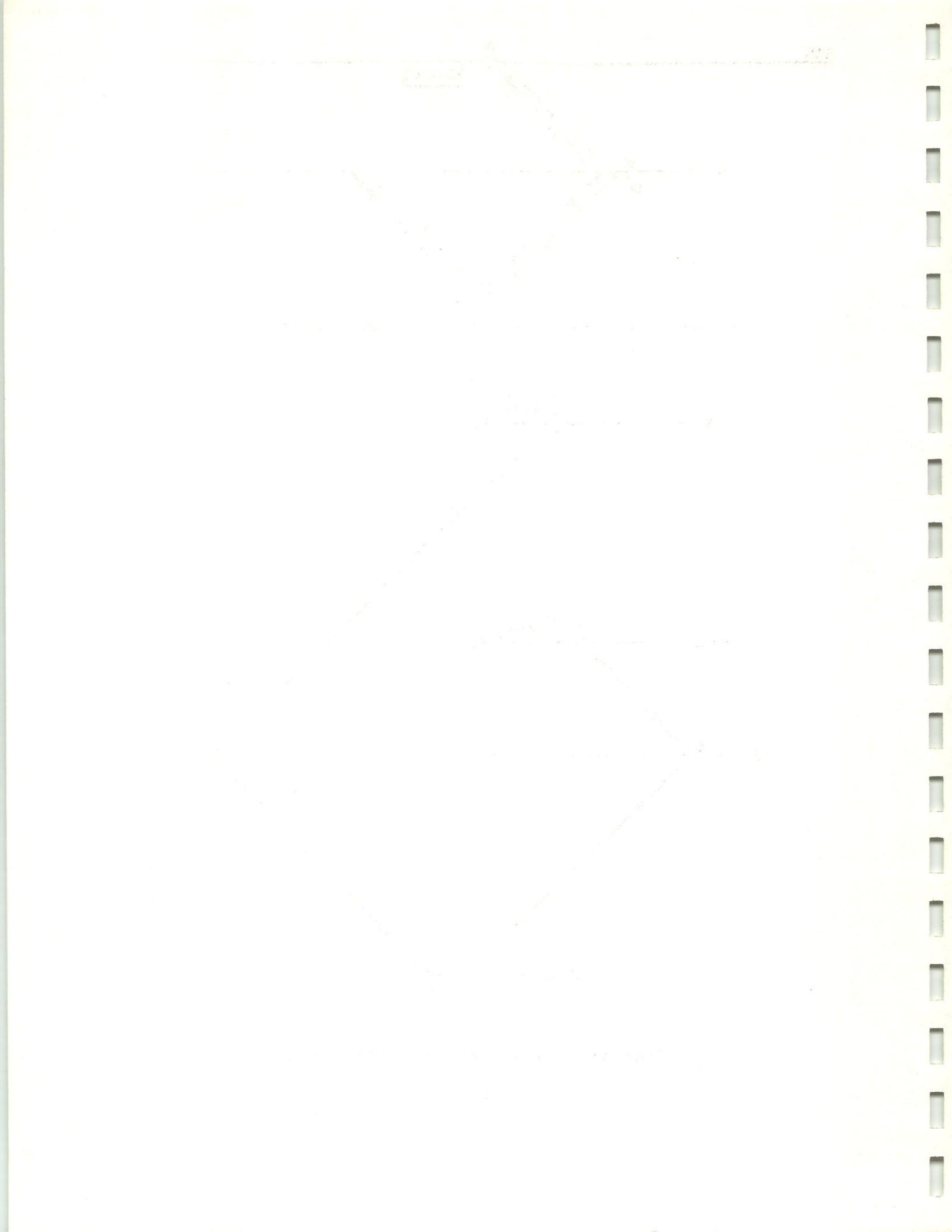


FIGURE 9-8. Low Speed to High Speed



X. TROUBLESHOOTING AND MAINTENANCE

10.1 TROUBLESHOOTING THE PCT-1000

If the transport will not load tape, or otherwise fails to function properly, perform the following operator checks prior to notifying maintenance personnel.

- (1) If unit is totally inoperative, check the line fuse under the sliding plastic cover on the rear of the transport next to the power cord receptacle.
- (2) Ensure that supply reel is positioned such that tape will unwind if the reel is turned clockwise (as viewed from above).

10.2 MAINTAINING THE PCT-1000

Operator maintenance of the Model PCT-1000 MAINSTREAMER Formatted Tape Transport is limited to daily cleaning of the tape path components. Also, clean the exterior of the unit as necessary using a soft cloth moistened with alcohol.

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